INFORMATION REPORT INFORMATION REPORT

CENTRAL INTELLIGENCE AGENCY



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S-E-C-R-E-T

COUNTRY USSR

REPORT

SUBJECT Projects, Activities, and Personalities at Kuchino

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DATE ACQUIRED This is UNEVALUATED Information

SOURCE EVALUATIONS ARE DEFINITIVE. APPRAISAL OF CONTENT IS TENTATIVE.

Comments:

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1. On page 2 and throughout the report read Marfino for Mafino.

2.

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3. Read Major Malyutin for Major Malutin throughout.

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| STATE | X | ARMY | #X | NAVY | X | AIR | #X | FBI | | AEC | | | | OSI AM X |
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(Note: Washington distribution indicated by "X"; Field distribution by "#".)

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PART II. - REPORT

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2. Personalities at KUCHINO:

| | |
|---|---|
| Colonel ZHELEZOV | Head of KUCHINO, MARFINO and SPIRIDONOVKA |
| Colonel DOBROZHANSKIY | Head of KUCHINO |
| Major VOLKOV | Head of Laboratory No. 3 (D/F and Radar) |
| Major ZHDANOV | Head of Laboratory No. 9 (Border Protection) |
| Lt.-Col. TOKAREV<br>Major ARAPOV<br>Major MALUTIN | Staff members of Laboratory No. 9. |
| IVANOV | Political Commissar at KUCHINO. |

3. The projects known to be in hand at KUCHINO between January 1950 and September 1951 [redacted] 25X1

(i) Tape recorder development:

Experiments were in being to improve the quality of play-back, cut down weight and physical dimensions. One of the chief troubles in improving play-back quality was the difficulty of producing small motors with a constant speed. The Informant was told that a British export recorder was being copied.

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(ii) Various D/F and radar projects.

(iii) Development of means of producing pharmaceutical emulsions by ultra-sonic methods.

(iv) Research on a method of rendering a human being unconscious by ultra-sonic means.

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(v) Research on electro-encephalography.

( (iv) and (v) were under the direction of Dr. POLSTER.

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(vi) Development of a barbed wire fence which would be coupled to a source of electrical energy such that any persons coming into contact with the fence would be unable to release himself. Animals were used in laboratory experiments and suffered considerable pain. Final result not known to Informant.

(vii) Development of concealed microphones for use behind wall pictures, under table tops, etc.

(viii) Solar heat water distillation plant for drinking and washing water, consisting of several wooden containers, was built; worked satisfactorily. A good number of these was produced.

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(ix) Capacity line for border protection: A line was strung 2.5 metres above the earth and a tap every 100 metres led to an indicator device. A person approaching the line caused the capacity between line and earth to vary.

4. KUCHINO

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(i) Test apparatus for checking parabolic mirrors

A simple device was developed for checking the physical configuration of parabolic metal mirrors which were to be produced elsewhere in large numbers for the Border Protection Ministry (GRENZSCHUTZ). It was stipulated that the device must be capable of operation by unskilled personnel.

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(ii) Microscope for the observation of living cells in liquid under the influence of ultra-sonic radiation.

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The frequency was to be variable, between 50 KC/S and 2 MC/S, and the generator was to be capable of producing 10-1,000 watts.

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(iii) Infra-Red Warning Set

The apparatus was ordered by the Department for Border Protection. The development and production took place in the KUCHINO Laboratories of the M.G.B. The task of the apparatus was the guarding of long stretches of border country. The idea was to erect posts at varying distances along the border whereby persons passing a defined line by night should be detected. The principle utilised modulated infra-red radiation on to a receiver.

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Interruption of the ray caused a relay at the receiver end to trip. It was stipulated that the warning set should be as small as possible and easily transportable. In the course of the development three models were evolved. The second model was produced in about 30 samples, and [redacted] was put into service. [redacted] the plan called for several hundred of this type of apparatus to be brought into service. [redacted] in September, 1951 this type was not completely developed and the M.G.B. were cautious about putting it into series production. [redacted] unless special efforts were made to clear the remaining development requirements it is possible that this set is not yet in series production.

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In the first model a sharply focussed beam fell on a prism which had the property to reflect back in the same incident direction all incoming rays. This prism consisted of a three-sided pyramid, with edges 5 cm. The ray is then incident on the base which is an equilateral triangle, and is reflected parallel to itself. Various prism sizes were tried which did not differ greatly from each other in performance. The reflected ray is concentrated in a mirror which is located behind the radiating element, and focussed on a convertor. (See Sketch I, Annex "A"). In practice, the incident ray is not reflected in a really narrow beam so that there is an area round the radiating source of reflected light. Sketch I, Annex "A" shows the path of the ray from the lamp to the prism then to the parabolic mirror and to the convertor. Certain details of construction are shown in Sketch II, Annex "A" and in Appendix "B".

Sketch II, Annex "A" shows the construction of the radiating unit with the principal arrangements for the adjusting of the actual radiating element. As is pointed out later, built-in centralisation of the radiating element could not be applied. The filament of the lamp was brought into the central radiation axis by means of three pairs of screws. The correct distance of the lamp from the lens was achieved by movement of the lamp along the axis. Three screws at the rear of the lamp-holder served to hold the lamp in the correct position if a spring was provided between the rear cover and the lamp base. The lens was a good anastigmatic lens. In front of the lens was the infra-red filter consisting of a circular sheet approximately 0.5 mm. thick and made of a hard rubber-like material. The filter was screwed into the lamp housing; Annex "B" shows the assembly of the housing, mirror, convertor and lamp. The receiver amplifier was contained in the space behind the mirror. The convertor was secured by rings which were in turn held by three screws around the periphery. A later variant is shown in Annex "C". In this the convertor is partly contained in the amplifier space. This arrangement had the advantage of a certain space-saving compared to the first arrangement but did not differ in performance. The lamp source remained the same but is easily replaceable in a somewhat similar way to the interchangeable objective of the well-known miniature camera. The modulation of the infra-red radiation was achieved by a conventional chopper similar to that used in car radios. It soon became apparent that this type of modulation was not satisfactory, particularly because of the thermal inertia of the lamp. Attempts to overcome the inertia by filling the lamps with gas gave no improvement, probably because then the steep current pulses through the chopper

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deviated too seriously from the sine form. [redacted] 25X1

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[redacted] the system needed a better 25X1
method of modulation. Later experiments on improved modulation methods are mentioned further on in this report. The next step was an experiment with another form of mechanical modulation. Two metal discs, as shown in Annex "A", Sketch III, were introduced into the beam, one being rotated by an electrical motor. This system was, however, never seriously considered for practical use, and was only used for comparison purposes. Various types of lamps were tried, voltages lying between 2 and 4 volts and wattages between 0.05 and 2.5 watts. It was shown that the wattage of the lamp itself did not greatly influence the results. A more significant role was played by the actual form of the filament and the sharpness of the spot. The receiver amplifier circuit is not known [redacted] 25X1
He can recall only that fairly small valves were used, i.e. pentodes with glass envelopes and bases of about thumb size. The amplifier supply was a 4 volt accumulator and a small 60 volt dry battery. With both the above types of apparatus they achieved 15-20 mv. at the output of the amplifier with the prism at a distance of about 300 metres from the radiating source. By using disc chopper modulation this distance was increased to some 400 metres. When a person stepped into the ray at any selected point the relay trip caused the lamp to light. At the same time one could distinctly hear the sound of the relay trip.

A further development was taken up with the intention of permitting the direction of movement of an intruder to be determined, i.e. to show whether the person was intent on leaving or entering the country. To this end a particular lamp was chosen with its filament in the form of an elongated "S". Only at the ends was the filament bent. The remainder of its length being linear. At a distance of 500 metres a picture of the filament approximately 4 metres long and 0.5 metres wide was projected. The projected picture of the filament lay horizontally and at each end of the picture was a receiver. With this arrangement the prism was dispensed with. Depending upon which side of the beam was interrupted first one or other of the receiver relays was activated (see Annex "D"). The same receiver was used in this system as in the second model, but the lamp and receiver were now separated. The same output voltages were achieved as in the first model, with sender and receiver 500 metres from each other. [redacted] with this apparatus 500 metres 25X1
was a practicable distance at which it could be put into service. A white light appeared when either of the two rays was interrupted, and as the second ray was interrupted, a second light came on - either green or red - depending on the sequence in which the rays were interrupted. In practice the red light came on when a person was attempting to cross the border outwards and the green light if attempting to cross inwards. The nearer the line-crosser was to the lamp source, and the quicker he moved naturally caused the two receivers to trigger in quicker sequence. So that in the neighbourhood of the lamp it was shown that the order of triggering could not, in many cases, be determined. Experiments indicated that a man moving at a rate of 100 metres in ten seconds, at a distance from the lamp of 15 metres could be observed on both lamps; his direction of movement, however, could not then be determined with any certainty. It was, therefore, determined not to put the observation posts in the neighbourhood of the lamps but in the neighbourhood of the receivers. The arrangement of the observation posts was planned as follows: Every 1,000 metres two lamps should be set up radiating in opposite directions. In between each set of lamps should be two receivers with receptivity in opposite directions. Distance between each lamp and receiver to be 500



[redacted] 25X1

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metres. At each receiver position a guard post was to be established which by this means was responsible for a length of 1,000 metres. A very real fault of this system lay in that when the lamps were replaced the focussing was imperfect. As the guard post personnel were not likely to be in the position to adjust the new lamps the set would be out of service at the expiry of its original map life and must be returned to the laboratory to be re-set up. At the time of the production of the first samples it was not possible to obtain properly centred lamps as this did not figure in the production programme of the supplying factory. When this was drawn to the attention of the laboratory chief at KUCHINO he stated that the Border Protection people had explicitly stated in writing that they would be responsible for the replacement and adjustment of lamps. He went on to say that if, in fact, the user agency could not do this in practice that was the agency's own affair. 25X1 in the course of time the warning sets would be supplied with properly centred replacement lamps. 25X1

The tendency of development in September 1951 was towards making the warning sets smaller and handier. Although a greater effective working distance only has point in a reasonably flat terrain this was also sought after.

The only actual improvement of the whole equipment consisted in a higher degree of modulation of the infra-red ray. Experiments were conducted with the intention of modulating the ray ultra-sonically. In a small trough filled with "Toluol" they embedded a quartz crystal of 1.8 mc/s. The quartz crystal was sub-modulated with 50 cs. or 100 cs. and used to modulate the infra-red beam. This was achieved quite simply by situating the trough somewhat in the manner of a filter in front of the lens. With this arrangement they achieved a modulation depth of 60% with the first experiments, while with the chopper they only managed 8-10%. 25X1

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the M.G.B. would definitely adopt the ultra-sonic method of modulation. 25X1

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They were constantly handicapped by the lack of infra-red spectrometers which they repeatedly asked for but never received. In consequence of this spectrometric measurements were not made but 25X1 the essential spectrum in the experiments was in the nature of 1-3 microns. 25X1 the lenses and filters showed average properties.

(iv) Infra-red telescope

(See Annexes 'E' and 'F'). 25X1

25X1 The plans called for production of the I.R. telescope in various sizes, including a model such as that fitted to German Panzers during World War 2. A considerable number of these ex-Panzer types was held by the Soviets at KUCHINO. The picture convertors used for the telescope were Soviet copies of the German A.E.G. type, which was described in detail in a U.S. Magazine - "Optical Sciences". 25X1 These convertors were manufactured in a MOSCOW works. 25X1 built a small portable version of an I.R. telescope in the Summer of 1951. (See Annexe 'F'). The viewing unit was powered by an induction coil supplied by a 400-volt dry battery. A push button switch on the front of the grid caused the coil to charge a condenser, which discharged through a long time constant.

The convertor took three micro amperes at 10 kv.

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[redacted] 25X1

(v) Apparatus for Coastal Protection by Submerged Microphones (late 1950)

The plan [redacted] called for a coastal protection device to be put into extensive service around Soviet coasts. The general principles to be followed were outlined to Informant who was instructed to carry out development work, but in fact was not allowed to proceed. The principle was to submerge magneto-striction receivers of various frequencies at varying distances from each other. A multicore cable was to lead to a central amplifier. It was hoped to detect and localise incoming motor boats and larger ships with a high degree of accuracy. Many Soviet experts were called in to the discussions, and at one stage it was proposed to go ahead with the construction of an installation at an estimated cost of 10 million roubles. Informant, who was not present at the debates for and against the project, was later told that after lengthy and acrimonious discussions the project had been abandoned. 25X1

(vi) Ultra-sonic Modulation Filter

The requirement arose in connection with the border protection project and also was part of a requirement for an infra-red speech equipment. The filter was to be small and durable with minimum power consumption. A sample of the LS 80 infra-red speech-set produced by Zeiss Jena in 1935 was available, and when Informant suggested that this be copied, the Soviets declined the proposals, saying it was beyond their capabilities.

(vii) Excavation of Habitable Cavities in the Earths Surface by means of Ultra-sonics

This problem was discussed at length by senior officers of the Institute. [redacted] the matter had not progressed beyond the discussion stage in September, 1951. 25X1

GENERAL

[redacted] at KUCHINO:- 25X1

(i) The MGB did not get good co-operation from other laboratories and works.

(ii) The MGB inspected the border protection projects, but did not control them.

(iii) Border protection tasks had a higher degree of classification than purely MGB tasks.

PART III- REPORT

INDEX OF PERSONALITIES

Col. fnu ZHELEZOV - Head of the MGB Research and Development establishments at KUCHINO, LEFINO and SPIRIDONOVKA.

Lt. Col. DOBROZHANSKIY - Head of KUCHINO.

Major ZHDANOV - Head of Laboratory No. 9 (Grenzschültz). A very dim individual.

Lt. Col. TOKAREV - A member of the staff of Laboratory No. 9; a good average engineer.

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Major ARAPOV - A member of the staff of Laboratory No. 9.

Major MALUTIN - A member of the staff of Laboratory No. 9: engineering ability above average.

fnu IVANOV - Political Commissar at KUCHINO.

PART IV - REPORT

LIST OF APPENDICES and ANNEXES

APPENDIX 'A'

Note on Ultra-sonic modulation of Infra-red.

ANNEX 'A'

Sketches of Infra-red warning device.

ANNEX 'B'

Detailed sketch of Infra-red warning device.

ANNEX 'C'

Detailed sketch of Infra-red warning device.

ANNEX 'D'

Sketches of wide beam infra-red warning system.

ANNEX 'E'

Sketch showing principle of infra-red telescope.

ANNEX 'F'

Detailed sketch of infra-red telescope.

ANNEX 'G'

Layout of OBJEKT I - KUCHINO. Key to Annex 'G'.

Key to Annex 'G'

1. Guard House.
2. Factory and Workshops
3. Canteen for non-prisoner staff.
4. Iron Store.
5. Barrack Store prisoners.
6. Canteen for prisoners.
7. Wood shed.
8. Administration building, cloak rooms, etc.
9. Laboratories.
10. Laboratories.

[redacted] 25X1

11. Miscellaneous Store.

12. Prisoners' bath house.

13. Carpenters' shop.

14. Miscellaneous store.

15. Building in process of construction (September 1951).

16. Wood store.

17. Laboratories, Technical administration, Library and Workshops.

18. Garage.



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APPENDIX 'A'

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Note on Ultra-sonic modulation of an Infra-red Ray

The modulation of a ray ultra-sonically rests on the principle of the optical grid. On passing through the grid the ray will be distorted if the grid mesh is comparable with the wavelength of the ray. A standing wave in a liquid, e.g. Toloul produces such a grid if the frequency is sufficiently high, and with ultra-sonic frequencies of several megacycles this is quite practicable. Thus the ray in its passage through the grid is modulated at the applied frequency. If now the ultra-sonic ray is sub-modulated with an audio frequency, the grid will form and disappear at this latter frequency, and the ray will also have audio modulation. With such an arrangement it is necessary to use linear filaments in the lamp source; if a coiled filament is used the spirals run into each other at the receiver end and the modulation is badly distorted. The higher the ultra-sonic, and the greater the dampening in the liquid, the more effective is the grid as a modulating agent with high modulating frequency. The viscosity of the liquid plays a significant role, but in the band of speech frequencies, modulation by ultra-sonic frequencies is always possible.

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Annex A.

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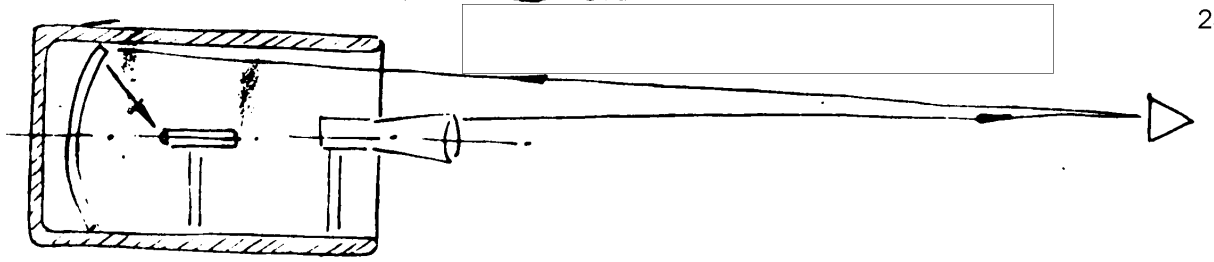
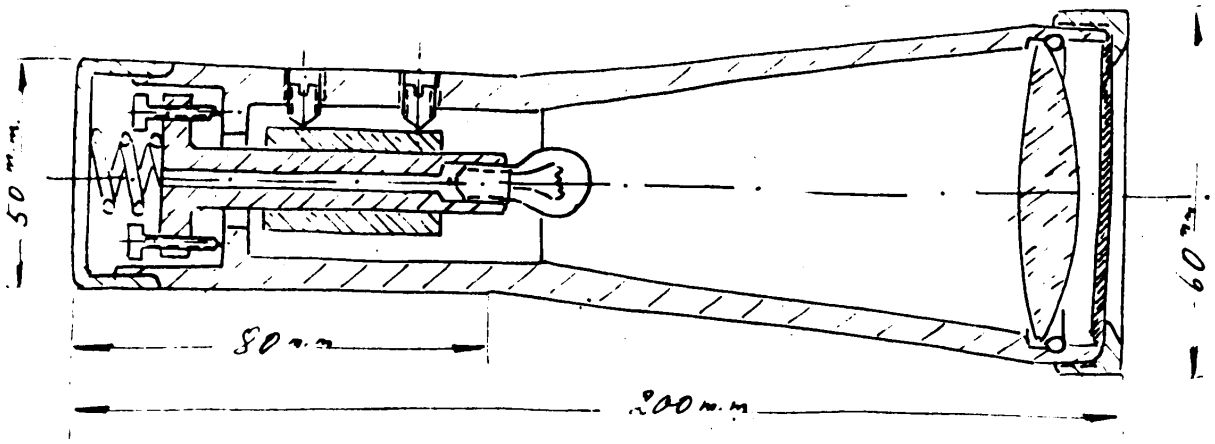
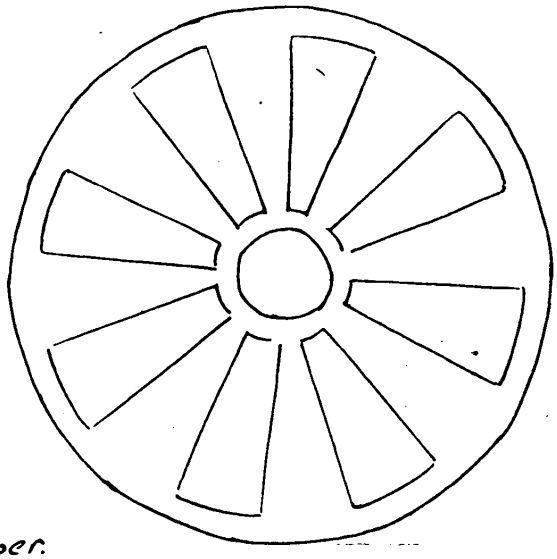


Sketch ~~Abb.~~ 1. First Type I.R. Warning Device




Sketch. ~~Abb~~ 2



Sketch. 3.
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Disc Chopper.

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Anlage B.

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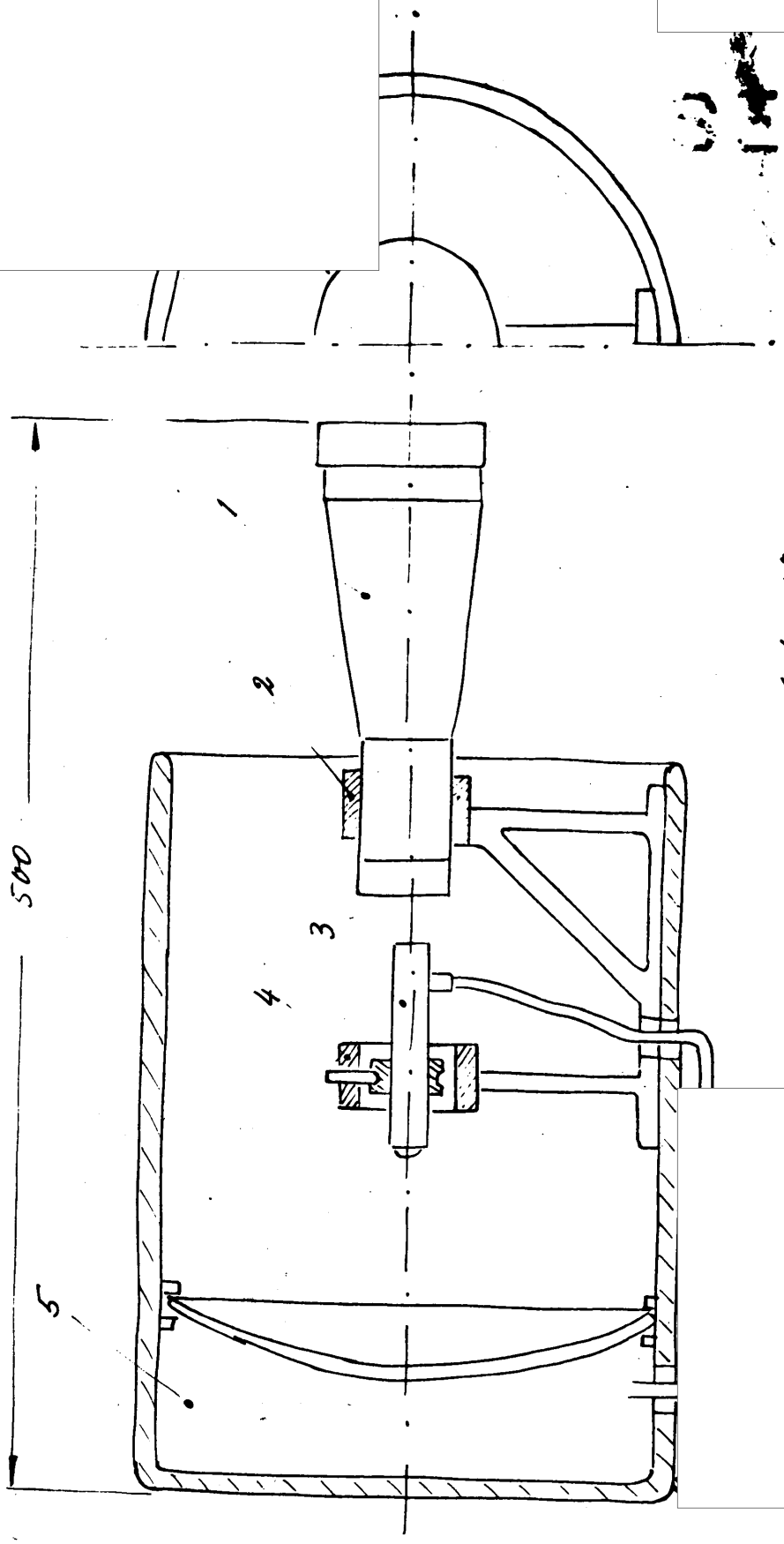


1. Lampe
Lampfolder - 2. Halterung f. Lampe
3. Photoelement
4. Halterung
Lampe Adjustor -
Amplifier space - 5. Raum f. Verstärker

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Annex C.

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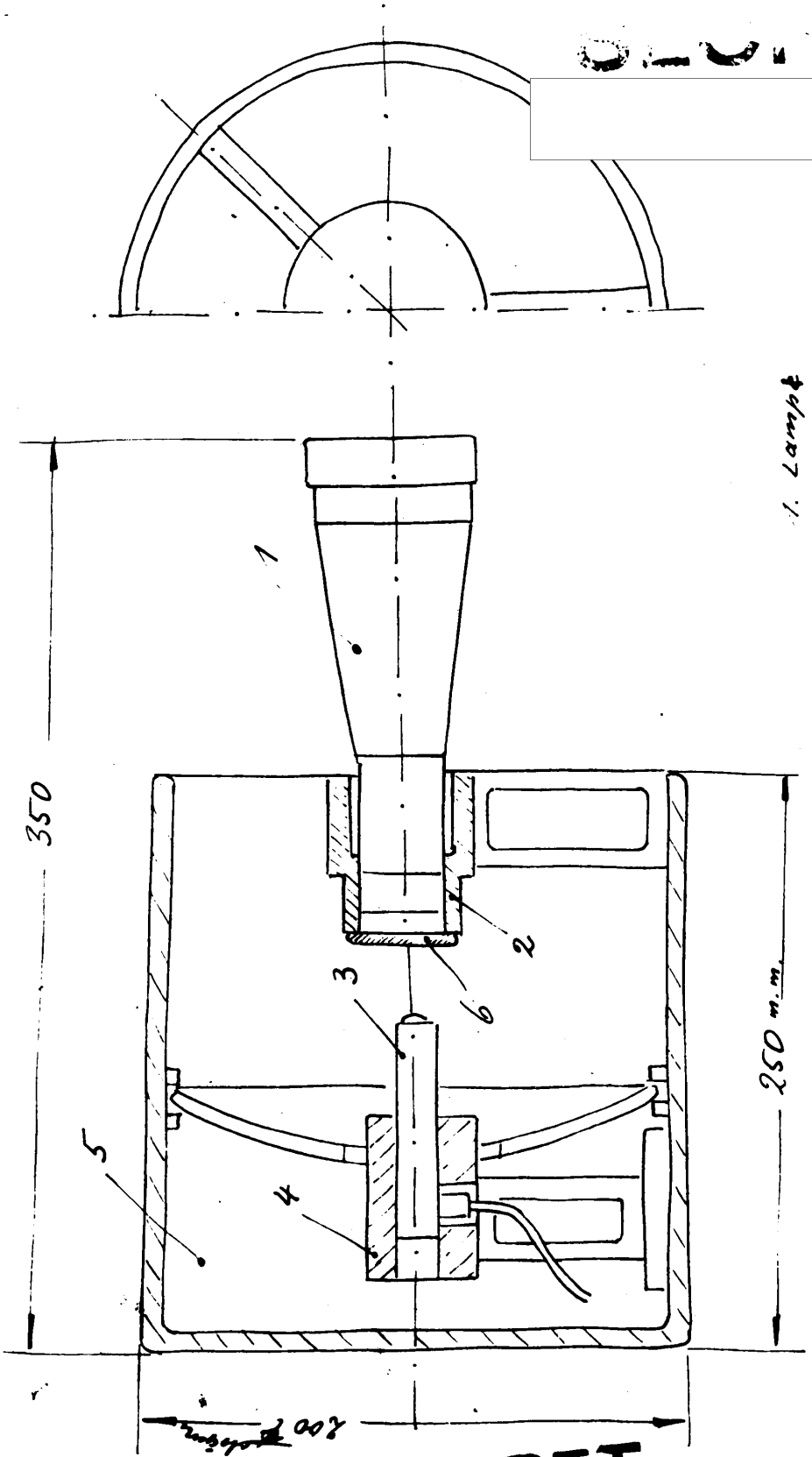


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Annex D.

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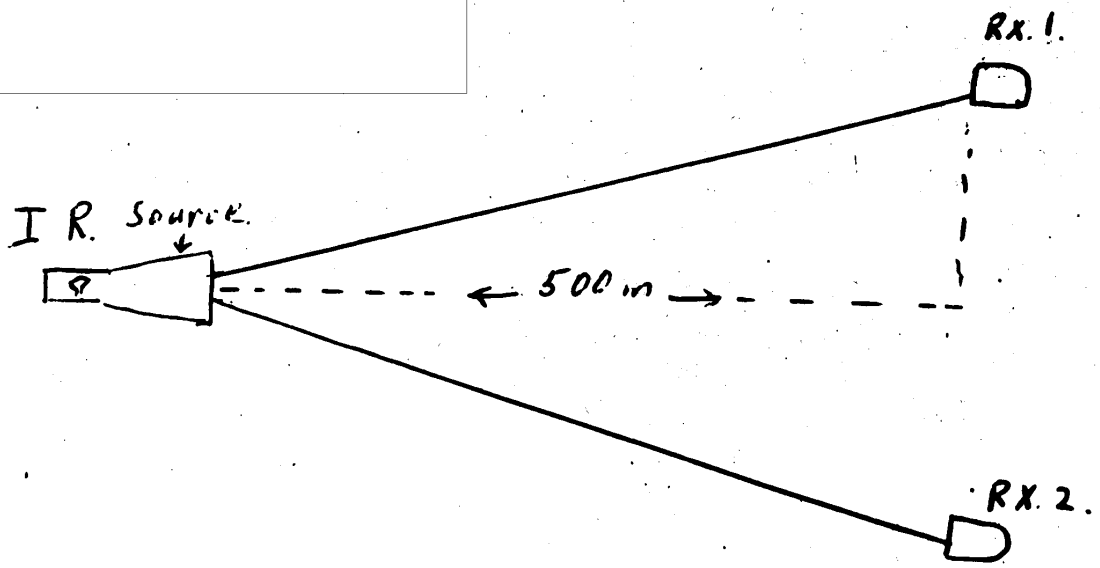
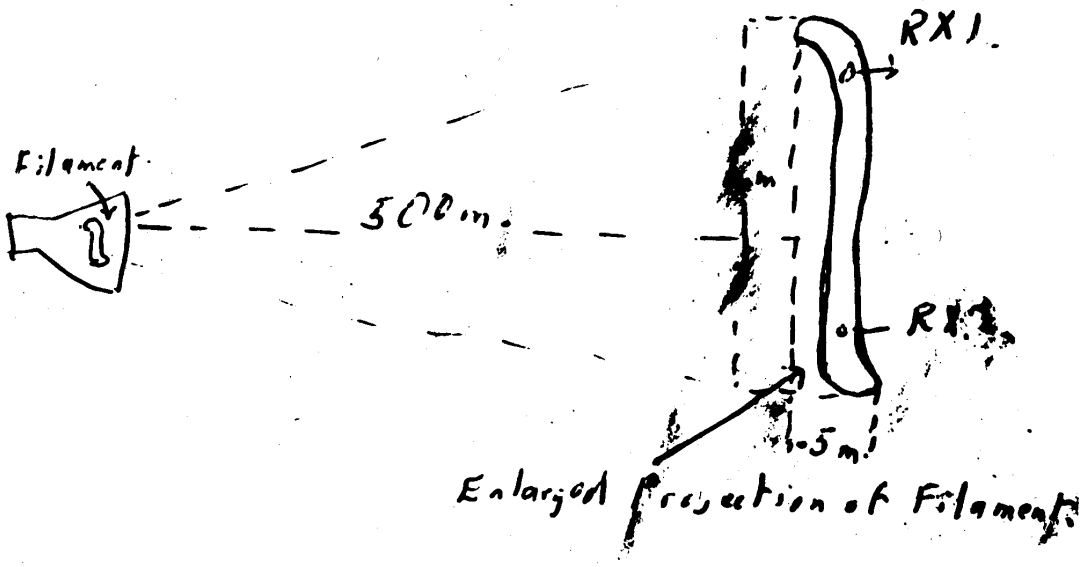



Sketch. 1. - Wide-beam I.R. Warning System.




Sketch 2. - Method of Projection

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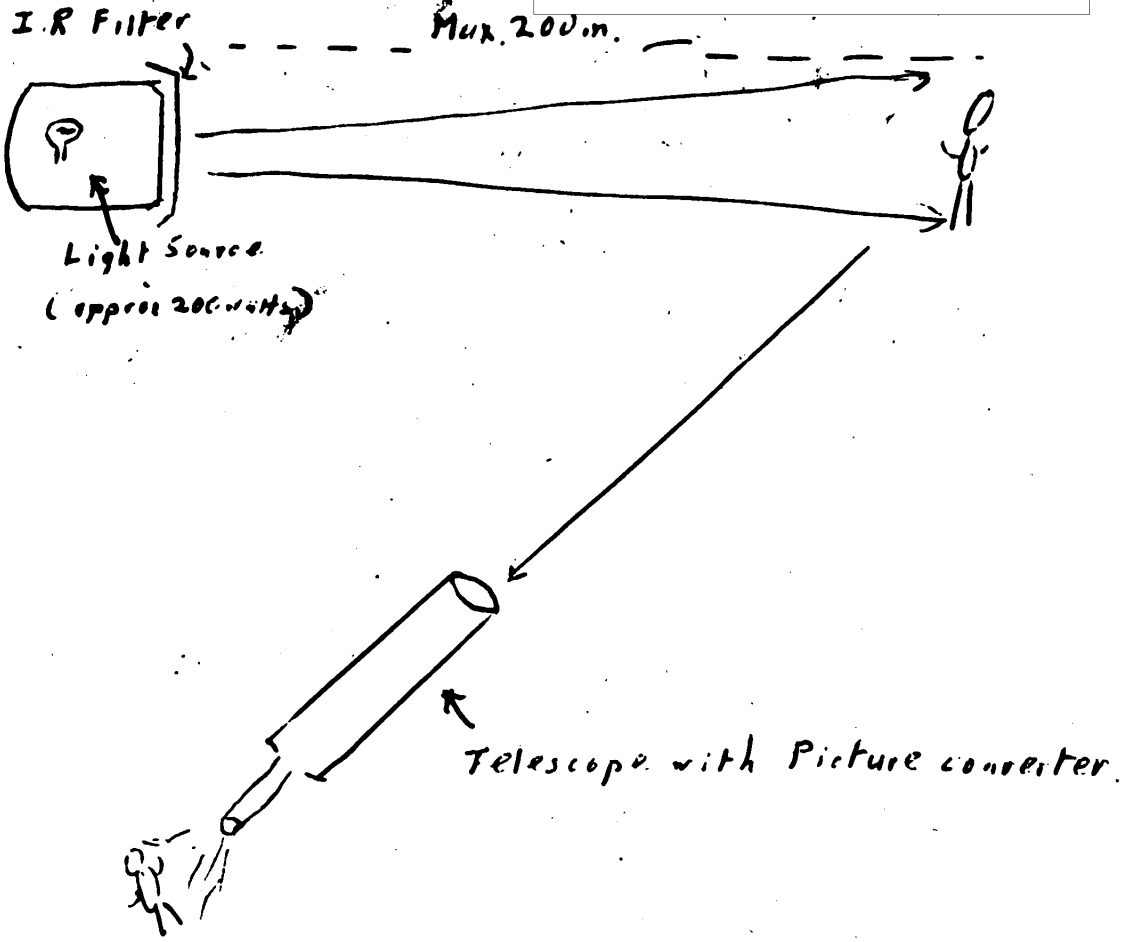


Principle of Infra-red Telescope

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Annex F

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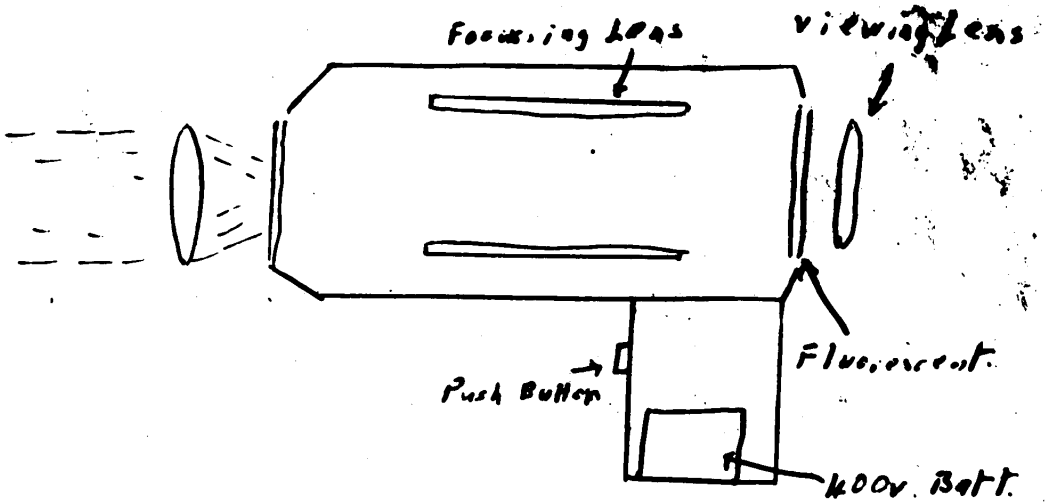
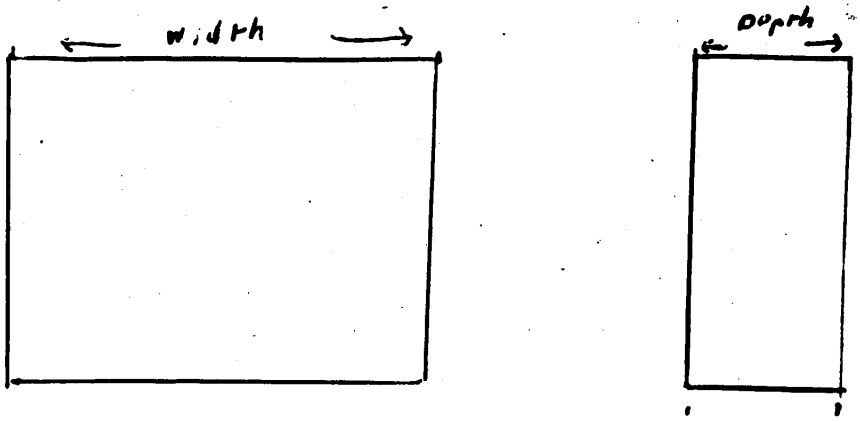



Sketch 1 - Details of I.R. Telescope - Viewing Unit.




Sketch 2. - Actual physical size of 400v. Batt.

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Annex G.

Layout of objekt I. - Kuchino.

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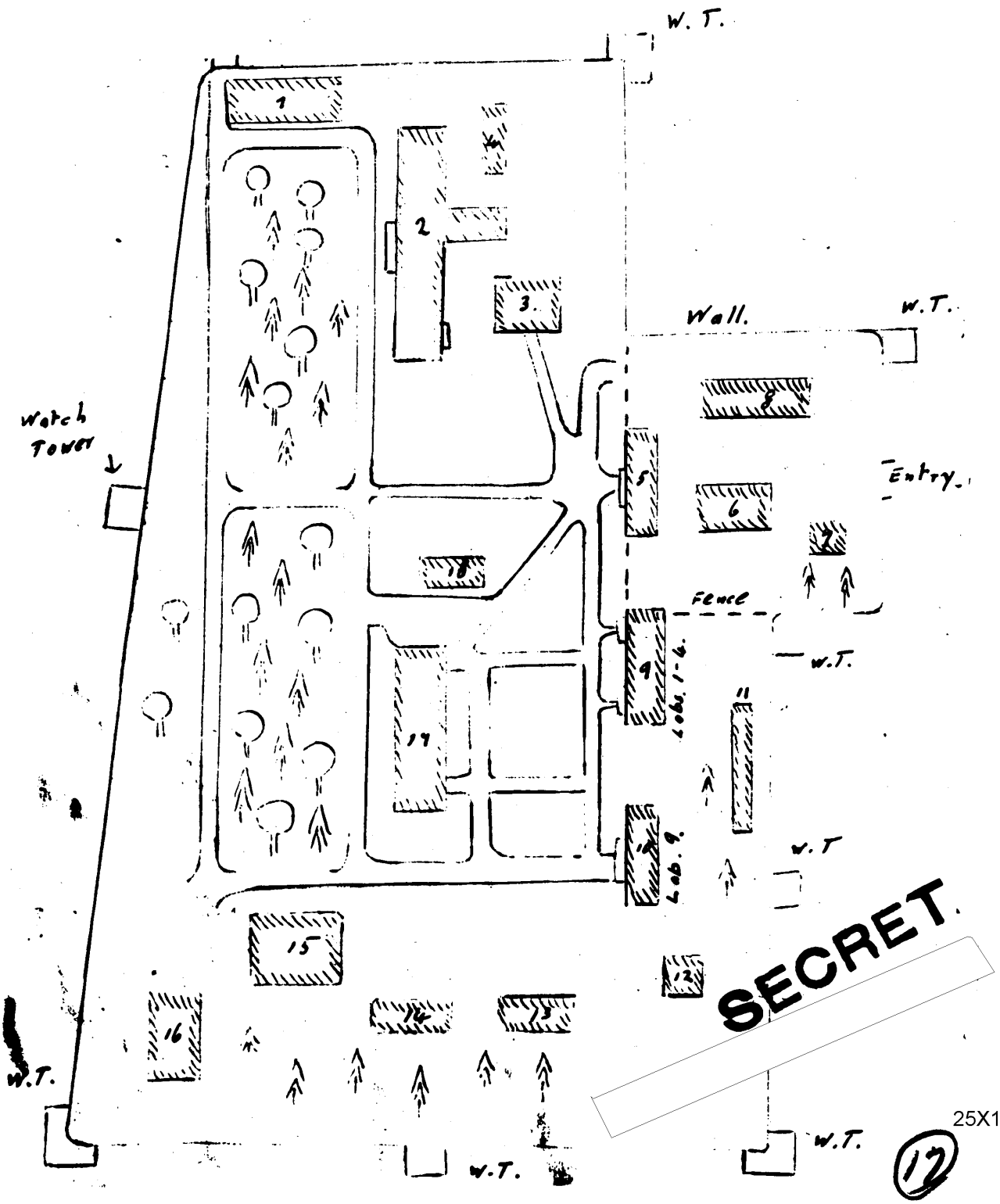


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